

SELF-CARE DIALYSIS 101

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OBJECTIVES

- Define home therapy modalities
- Pros and cons of home therapy modalities
- Patient considerations
- The natural progression. Where do we go from here?

The 10 largest U.S. dialysis providers in 2016

Dialysis Provider	# Patients	In-Ctr. Conv. HD	In-Ctr. Noc HD	Home HD	PD	Units	Patient growth 5/16 (vs. 5/15)	% growth 5/16 (5/15)
1. Fresenius Medical Care N.A.	184,084	163,883	1,714	2,855	15,632	2,277	5,747 (6,331)	3.2% (3.7%)
2. DaVita Kidney Care	181,800*	158,000	1,400	3,100	19,300	2,266	7,500 (8,000)	4.3% (4.8%)
3. U.S. Renal Care	23,992	21,370	---	382	2,240	367	7,942 (1,663)	49.4% (11.5%)
4. Dialysis Clinic Inc.	15,158	13,329	---	193	1,636	237	358 (338)	2.48% (2.3%)
5. American Renal Associates	13,420	12,050	100	117	1,153	198	1,170 (1,490)	9.6% (13.8%)
6. Satellite Healthcare	7,316	5,700	143	174	1,299	78	775 (326)	11.8% (5.2%)
7. Atlantic Dialysis Management	2,301	2,230	---	19	52	13	326 (678)	5.2% (12.1%)
8. Northwest Kidney Centers	1,638	1,339	---	52	247	15	75*** (n/a)	5%*** (n/a)
9. Centers for Dialysis Care**	1,590	1,590	---	---	---	15	(54) (10)	-3.3% (0.3%)
10. Rogosin Institute	1,506	1,401	---	40	65	8	n/a	(n/a)
2016 totals	432,805	380,892	3,357	6,932	41,624	5,474		

* Does not include pending acquisition of Renal Ventures Management (2,387 patients as of 5/15). **Excludes 96 in-center hemodialysis patients, 55 PD patients, and 50 HHD patients in three clinics where CDC owns less than 50%. *** Growth from 2014-2016.

Home dialysis patients by provider: 2011 vs. 2016

	2011 home patients	% of total patients	2016 home patients (+/- from 2015)	% of 2016 total (vs. 2015 total)
Fresenius Medical Care N.A.	10,812	7.9%	18,487 (+1,006)	10.04% (9.8%)
DaVita Kidney Care	13,700	10.6%	22,400 (+800)*	12.3% (12.4%)
U.S. Renal Care	390	6.6%	2,622 (+814)	10.9% (11%)
Dialysis Clinic Inc.	1,252	9.3%	1,829 (+21)	12.06% (12.2%)
American Renal Associates	565	8.0%	1,270 (+140)	9.4% (9.2%)
Satellite Healthcare	1,033	22%	1,473 (+104)	20.1% (20.9%)
Atlantic Dialysis	47 (2015)	2%	71 (+24)	3% (n/a)
Northwest Kidney Centers	253 (2014)	16%	299 (+46)	18.2% (16.1%)

* does not include RVM home patients (350 @ 5/15)

HOME THERAPY: MODALITIES

- Home Hemodialysis
 - Self Care (In-Center)
 - Conventional Therapy
 - Greater than 3x/week
- Peritoneal Dialysis
 - CAPD
 - CCPD

Who Might Want to be on Home Therapy? Or Would be Good for Home Therapy?

- Travels
- Few vascular access options
- Cardiovascular disease
- Pediatric
- Student
- Works
- Independence
- Control of health
- Distance from clinic

Who is an Appropriate Candidate for Home Therapy?

- Manual Dexterity
- Good eyesight
- Support system/partner
- Ability to learn
- Agree to perform PD/HHD
- Motivation

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HOME HEMODIALYSIS

SELF CARE HEMODIALYSIS

- In-Center self care bay
- Trained staff in-center to assist patient
- Home Therapy nurse trains the patient initially
- Pt learns and does what they can, at their own pace in the clinic
- Transfer to Home Therapy
- Stay In-Center doing what they can

Possible Contraindications to Home Hemodialysis

- Severe cardiovascular disease
- Lack of care partner
- Color blindness
 - Pt and caregiver
- Electrical/Plumbing changes to home
 - Cost

Conventional Home Hemodialysis

- Requires a portable RO
- 3X per week
- Often use Buttonhole method of accessing vascular access
- Requires a care partner
- Travel requires transient treatments
- Private insurance may cover staff assist in the home
- **Nocturnal**



Greater than 3x / week Home Hemodialysis

- Requires a care partner
- Up to 7 times per week
 - Often more frequent/shorter treatments
- Often uses Buttonhole method of accessing vascular access
- May/or may not require portable RO
- System may be portable for travel
- Private insurance may cover staff assist in the home
- Nocturnal



PERITONEAL DIALYSIS

Peritoneal Dialysis

- Needle-free
 - Use of peritoneal or pre-sternal catheter
- Portable
 - Travel
- Flexible
 - Choose treatment times that fit their day
- Freedom
 - More liberal diet and fluid intake
 - Fewer trips to the clinic
- Kidneys
 - Help to preserve residual kidney function longer
- Mortality
 - Lower in first 3 years



Who is an Appropriate Candidate for Peritoneal Dialysis?

- Children
- Small body size
- Severe cardiovascular disease
- Limited vascular accesses
- No care partner

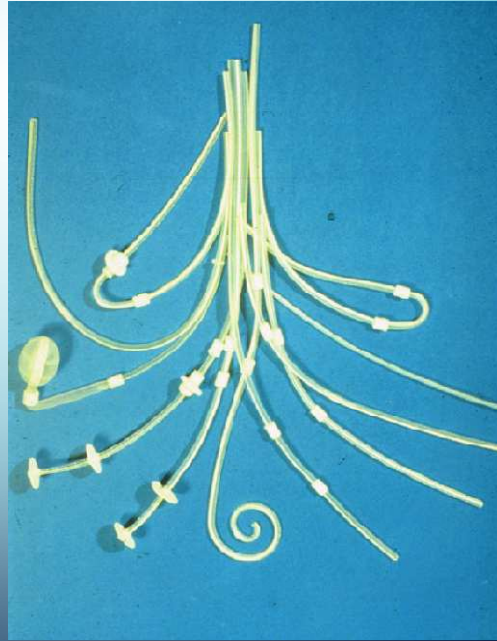
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Possible Contraindications to Peritoneal Dialysis

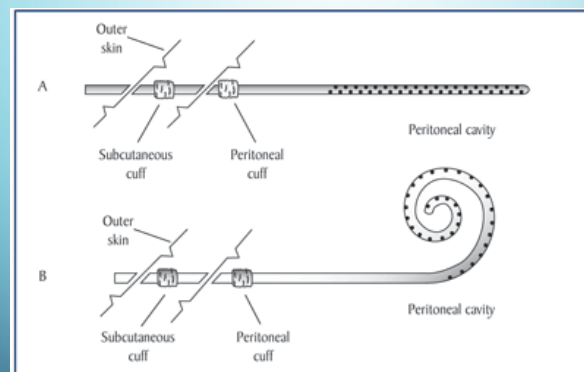
- Ostomies
- Incontinence
- Hx of abdominal surgeries
- COPD
- Non-compliance
- Morbid Obesity
- Hernias
- Low Back Pain

PERITONEAL CATHETER

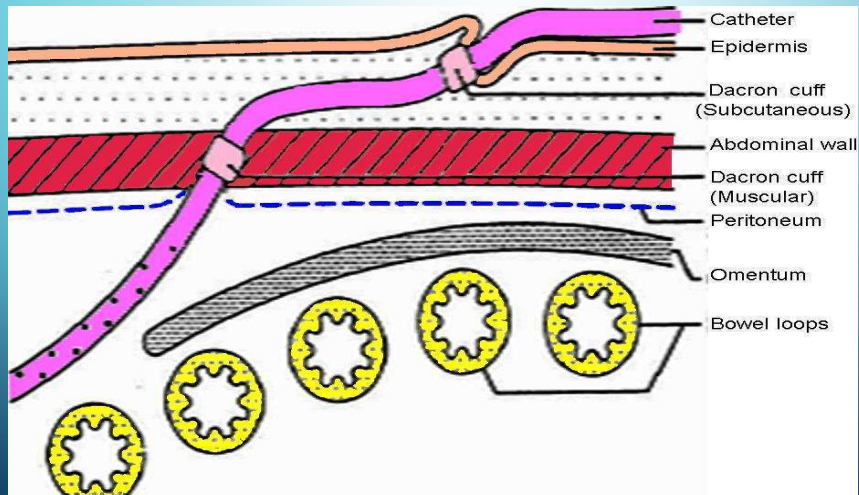
- Durable
- Soft
- Cuffed (single or double)
- Has radiopaque stripe
- Repairable



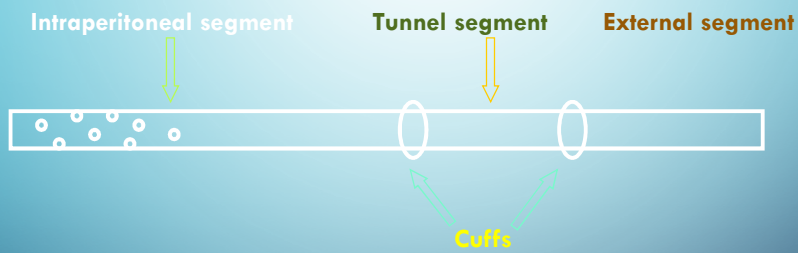
PERITONEAL CATHETER



PERITONEAL CATHETER



PERITONEAL CATHETER



Peritoneal Dialysis Exchange



Baxter Healthcare Corporation

Continuous
Ambulatory
Peritoneal
Dialysis

Continuous Ambulatory Peritoneal Dialysis

- Manual exchanges, works by gravity
- 4-5 exchanges per day
- 3-6 hour dwells
 - Bedtime exchange dwells through the night
- Uses dry heat only to warm solution
 - Heating pad
 - NO microwave
- Need IV pole or hook
 - No machine needed



Continuous
Cycling
Peritoneal
Dialysis

Automated
Peritoneal
Dialysis

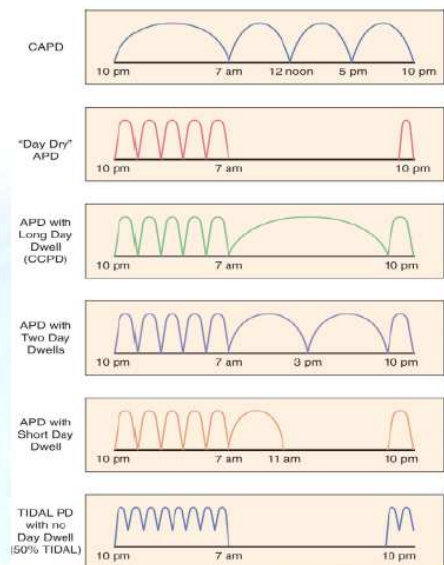
Continuous Cycling Peritoneal Dialysis

- Uses a machine
 - Typically 8-12 hours at night
 - May still require day time exchanges
- Fewer setups/connections/disconnections per day
 - Reducing chance of infection / peritonitis
- Frees up more time during the day for:
 - Work
 - School
 - Travel
 - Hobbies



Modalities of PD

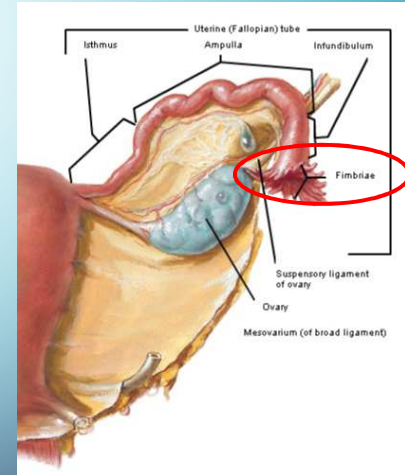
Brenner and Rector's The Kidney, 8th edition, 2008



- **Continuous cycled peritoneal dialysis-**
 - 3 to 7 cycles of 1.5 to 2.5 L delivered over 9 hours at nighttime.
 - Dwell times range from 45 minutes to 3 hours.
 - Dwell left in at the end of the cycling period and drained out again before the next cycling period about 15 hours later.
- **Nocturnal intermittent peritoneal dialysis or day dry APD**
 - No day dwell because of good residual renal function or mechanical contraindications.
- **High-dose APD or PD plus or APD with 2 day dwells**
 - more than one day dwell, requires another exchange sometime during the day.
- **APD with short day dwell-**
 - leaves some of the day time dry to facilitate ultrafiltration or for comfort or mechanical reasons.
- **Tidal PD-**
 - Incomplete drain of a proportion of the infused fluid before refilling with the next cycle.
 - Used to minimize down time with a poorly draining catheter or to avoid drain pain.

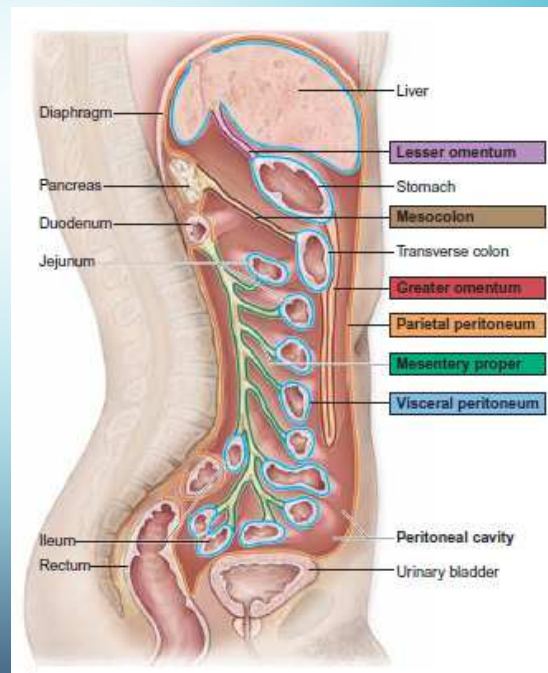
Peritoneal Dialysis

- A treatment for kidney failure
 - Uses the peritoneal membrane
 - Living, serous, semipermeable membrane
 - Lines the abdomen
 - Closed in males
 - Removes wastes and fluid from the bloodstream



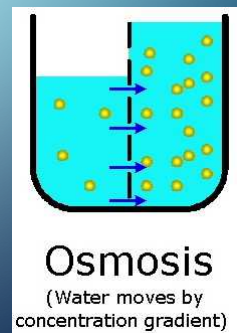
Peritoneal Membrane

- Visceral peritoneum
 - Covers abdominal organs
 - 80-90% of the peritoneum
 - Inefficient
- Parietal peritoneum
 - Lines abdominal wall
 - 10-20% of the peritoneum
 - Most efficient



HOW DOES THE PERITONEUM WORK?

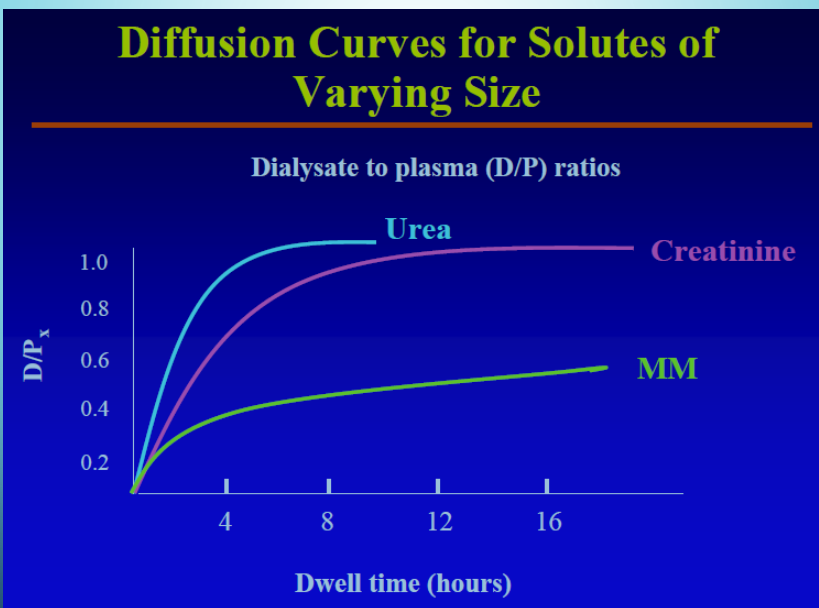
- **Diffusion** – movement of solutes from area of higher concentration to area of lower concentration
- **Osmosis** – movement of fluid from area of lower solute concentration to area of higher concentration
 - Trying to dilute the solute concentration
 - Convection – Water carries some solutes across the membrane with it



ULTRAFILTRATION

- Removal of fluid using more than one kind of pressure
 - **Positive pressure**
 - Blood pressure from the vasculature of the peritoneal membrane
 - **Negative pressure**
 - Dextrose concentration in the PD solution increases osmotic concentration gradient

Diffusion Curves for Solutes of Varying Size



Nolph KD, et al. *J Lab Clin Med* 93:246-256, 1979

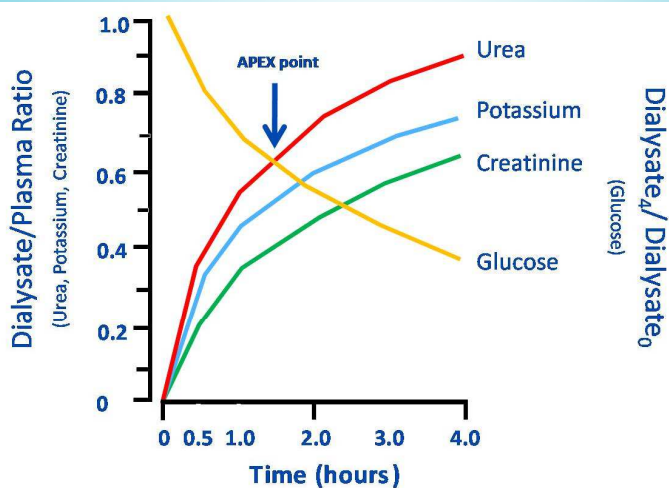


Figure 2: Illustration of APEX time, the crossing point of dialytic urea appearance (red), and glucose disappearance curve (yellow). APEX time indicates the optimal dwell time for ultrafiltration

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WHAT AFFECTS CLEARANCE?

- Membrane characteristics
 - Permeability
 - Effective surface area
 - Blood Flow
- Treatment time
 - Efficient dwells
- Dialysate flow rate
 - Number and/or size of exchanges

COMPOSITION OF PD SOLUTIONS

Dextrose	1.5% - 4.25%
Sodium	132 mEq/L
Potassium	None
Calcium	2.5 - 3.5 mEq/L
Chloride	96 - 102 mEq/L
Sodium lactate	448 gm/100ml
Magnesium	0.5 - 1.5 mEq/L

PET TEST

- Peritoneal Equilibration Test
- Done at about 4-6 weeks after starting peritoneal dialysis
- Repeated if there is an issue
 - Repeated peritonitis episodes
 - Abdominal trauma
 - Failure to meet adequacy
 - Long time on PD
 - Use of high dextrose solutions

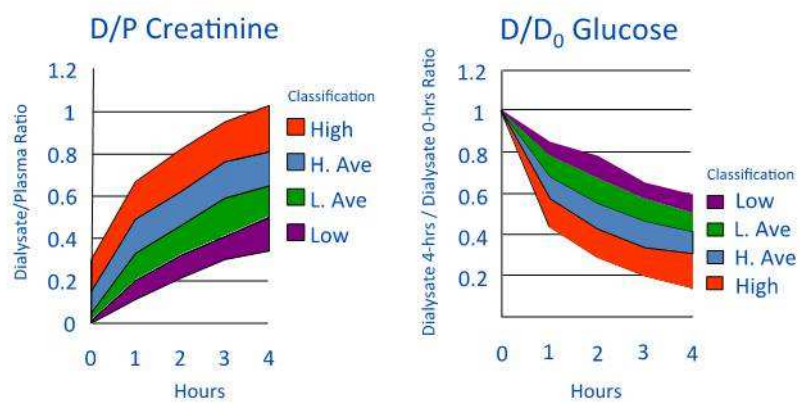


Figure 1: (Left) dialysate creatinine versus plasma creatinine at 4-hours (D/P creatinine); (Right) ratio of dialysate glucose at 4-hours versus dialysate glucose at time zero (D/D₀);

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<u>Transport Type</u>	<u>4hr D/P nCreatinine</u>	<u>Solute Transport</u>	<u>Net UF</u>	<u>Approximate UF</u>
High	0.82 - 1.03	Fast	Poor	1580 - 2084 ml
High Average	0.65 - 0.81	Good	OK	2085 - 2368 ml
Low Average	0.50 - 0.64	OK	Good	2369 - 2650 ml
Low	0.34 - 0.49	Slow	Excellent	2651 - 3326 ml

HIGH TRANSPORTERS



- Very efficient membrane
- Fast solute transport
- Poor net ultrafiltration
- At risk of low albumin
- Approximately 15% of patients
- Needs shorter dwell time
- May use more higher dextrose solutions
- CCPD

The Majority – Approximately 70% of patients

• High Avg Transporter

- Efficient membrane
- Good solute transport
- OK net ultrafiltration
- Need slightly longer dwell

• Low Avg Transporter

- Less efficient membrane
- OK solute transport
- Good ultrafiltration
- Needs little longer dwell

LOW TRANSPORTERS

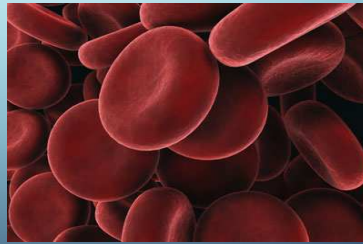
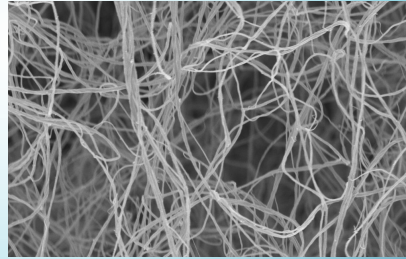
- Inefficient membrane
- Slow solute transport
- Great net ultrafiltration
- May have difficulty getting creatinine clearance



- Approximately 15% of patients
- Needs longer dwell time
- CAPD
- Combination of CCPD and CAPD

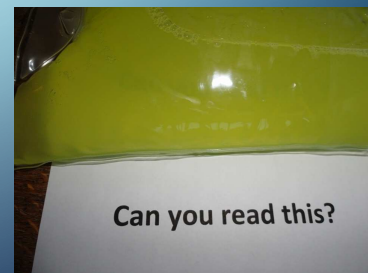
COMPLICATIONS

- Fibrin
- Clots
- Catheter position
- Leaks
- Infection



PERITONITIS

- Major reason patients are transferred to Hemodialysis
- CAN be prevented
- Peritonitis:
 - Inflammation of the peritoneal membrane
 - Peritonitis – Infection requires:
 - Effluent WBC ≥ 100
 - Neutrophils $\geq 50\%$



PERITONITIS

- Treatment:
 - Follow ISPD guidelines
 - Last updated 2016
 - Intraperitoneal antibiotics
 - Gram -, Gram +
 - Dwell of ≥ 6 hrs



CONS OF HOME THERAPIES

- Supply storage
- Frequency
- Patient / Caregiver burnout

WHERE DO WE GO FROM HERE?

- Consider PD for all possible patients at the start
- Timely modality change if indicated to Home Hemodialysis
- Timely change to In-Center

HOME

- The longer the patient remains in the home setting, independent, and an active participant in their care – the better the quality of life, lessened mortality / morbidity



QUESTIONS?



SUMMARY

- Defined home therapy modalities
- Pros and cons of home therapy modalities
- Patient considerations
- The natural progression. Where do we go from here?

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